

Expeditionary Warfare Conference

V-22 Osprey



BGen Jim Amos

**Assistant Deputy Commandant for Aviation
Headquarters United States Marine Corps**

**This Briefing is:
UNCLASSIFIED**



As a Corps... Our Future

Expeditionary Maneuver Warfare

- Marriage of maneuver warfare and naval warfare
- Seabased





Goals of EMW

Get to the fight and win quickly...

Against a larger foe...

On his own turf...



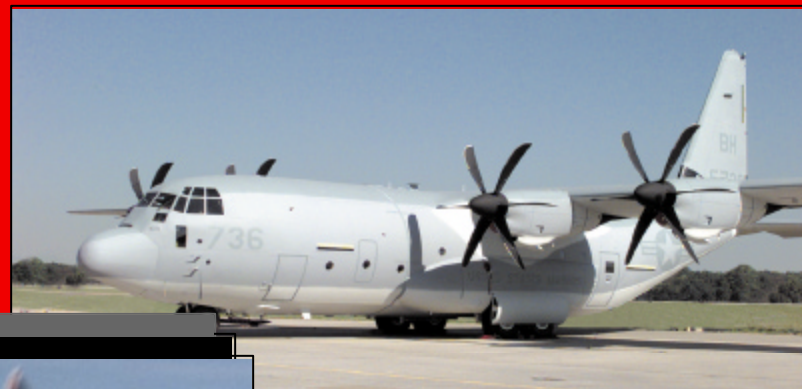
Without Host Nations Support (HNS)...

With sustainable combined-arms forces.



Marine Aviation's Part

Support EMW with a VSTOL FORCE





Why Osprey?

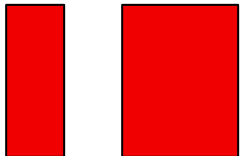
World Wide Self Deployability



Expeditionary in Nature



Capable Enough to Succeed



The Future



Operational Influence

- Speed, Range, Payload to influence the battlespace
- Large payload & on time delivery to critical needs
- On target with appropriate force
- Enhanced survivability



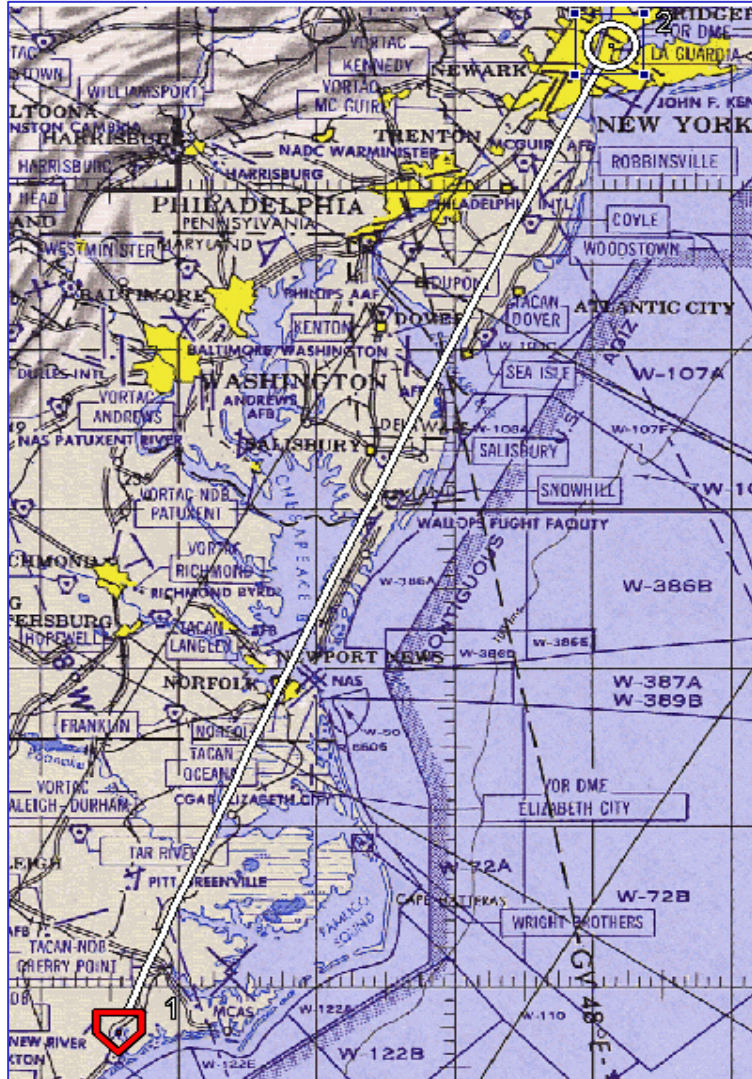
“Ideas have consequences...great ideas have great consequences.”

- Jeane Kirkpatrick



Rapid Response to Terrorist Event

Rifle Company (rein) from Camp Lejeune, NC to New York



1+42 Time of flight (240 kts)

3+10 for a CH-53E (130kts)

8 V-22s x 192 Pax

- 4 Rifle Platoons
- 1 Engineer Squad
- 8 Corpsman
- 4 Doctors
- 2 Chaplains

410nm

Landing at the Event Site with an additional hour of fuel for follow-on tasking



Bringing in a Credible Force

Single Lift - Up to 240 troops
Potential
Reduces heavy lift aircraft tasking



1.36M lb of cargo

or

**1900 troops
lifted 200nm**

***by one 12 aircraft
squadron***

in one day!



Rapid insertion of credible forces at multiple sites - simultaneously



11 Dec 2000 Mishap - *Impact*

- **A Great Tragedy** – we lost 4 Marines
- **Upside** – forced a full evaluation of the aircraft and program
 - Problems/deficiencies identified and understood
 - 2 years to fix
 - Final product will have unmatched capability and reliability
- **Conservative** path to return to flight – **Event** driven
- **Big Ticket Findings**
 - Hydraulics/Software/Validated Emergency Procedures



Blue Ribbon Panel Findings

- **Proceed with V-22**
 - No inherent safety flaw in the V-22 Tiltrotor concept
 - Requirement is justified
 - V-22 has demonstrated potential to meet requirement
- **Restructure the Program**
 - Program is not mature enough for full rate production or operational use
 - Reduce production to minimum level
 - Provides funds for maturation phase
 - Minimizes retrofit
 - Implement a Phased approach to return to flight operations
 - Before first flight
 - Fix flight control system (hardware and software)
 - Conduct extensive testing to validate
 - Before first operational flight
 - Flight test VRS
 - Conduct NATOPS review
 - Audit risk analysis
 - Continue testing
 - Before first operational deployment
 - Incorporate reliability and maintainability improvements
 - Validate/verify technical publications
 - Ensure availability of adequate spares
 - Continue testing





Restructure Deliverables

- **Flight Envelope Expansion**
 - **BRP and NASA assessments**
 - HROD / VRS
 - Shipboard compatibility
 - Section maneuvering envelope
- **Air Vehicle: Develop, Design, Test Modifications**
 - **EMD aircraft for testing first**
 - **Integrate changes and develop production/retrofit plans**
 - **Block A: Safe and Operational MV-22 for the Fleet (Deployable)**
 - **Block B: Improved Effectiveness, Suitability, and Maintainability**
 - **Block C: Mission Enhancement**



Return to Flight

Hydraulic System Design Review

- Thorough independent technical review of system design and validation
 - Design architecture
 - Redundancy
 - Material selection
 - Design validation/testing
- Estimated Completion Date: Nov 01



Return to Flight

Hydraulic System Design Review

- Initial Assessment
 - V-22 design approach meets flight control system and flight safety reliability specification requirements
 - Meets or exceeds other military rotorcraft
 - Must validate ability to land safely with single hydraulic system
 - Degraded modes testing complete Nov 01
 - Titanium is the correct material
 - Back-to-back testing



Return to Flight

Hydraulic System Design Review

- Current Actions for Critical Hydraulic Lines
 - Establishing Special Handling Requirements
 - Nacelle redesign
 - additional clearance requirements
 - Add protective coating or increase wall thickness
 - Prohibit attachment/crossover of any other lines
 - Daily inspection
 - improved access



Software Improvements

- HROD
- Warning Caution Advisories logic and displays
- False Alarms
- Flight Symbolology
- Digital Map capabilities
- Flight Information Recorder data



Roadmap to Full Operations

- Phase 0 – Technical Assessment and Complete Rigorous Flight Readiness Review (on going)
- Phase 1 – Resume Testing with EMD (MV and CV) Aircraft – Augment with LRIP Aircraft as Necessary (April 02)
- Phase 2 – Resume VMMT 204 Training Operations and Production Acceptance Flights (August 03)
- Phase 3 – Stand-up MV-22 Fleet Squadron / CV-22 Training Squadron at Kirtland AFB (Fall 04 first VMM transition)
- Phase 4 – Deploy First MV-22 Squadron / CV-22 Operational Employment



V-22 Program Commitment

- Recovery program is grounded in the Blue Ribbon Panel Report/Recommendations
- What's required:
 - Resources (money, full engineering support and time to adequately Test)

End State

Restore confidence in the Osprey aircraft's capabilities and deliver a safe, reliable, and operationally effective V-22 to the fleet



Conclusions

- 21st Century *is* characterized by
 - Increasing regional instability
 - Accessibility to sophisticated weaponry
 - Enemy is willing to use available methods
- Expeditionary forces growing in importance and applicability
 - Cornerstone of US military strategy



Uncertainty ... Stimulus for Evolutionary Transformation

A black and white composite image. In the foreground, a helicopter is shown from a low angle, flying towards the viewer. Its rotors are blurred, suggesting motion. In the background, a small airplane is visible, trailing smoke or a wake. A large, bright full moon is in the upper right corner, illuminating the scene. The sky is dark with some clouds.

Questions?

We sleep safe in our beds because rough men stand ready in the night to visit violence on those who would do us harm.

-- George Orwell



Backups



Improved Crashworthiness

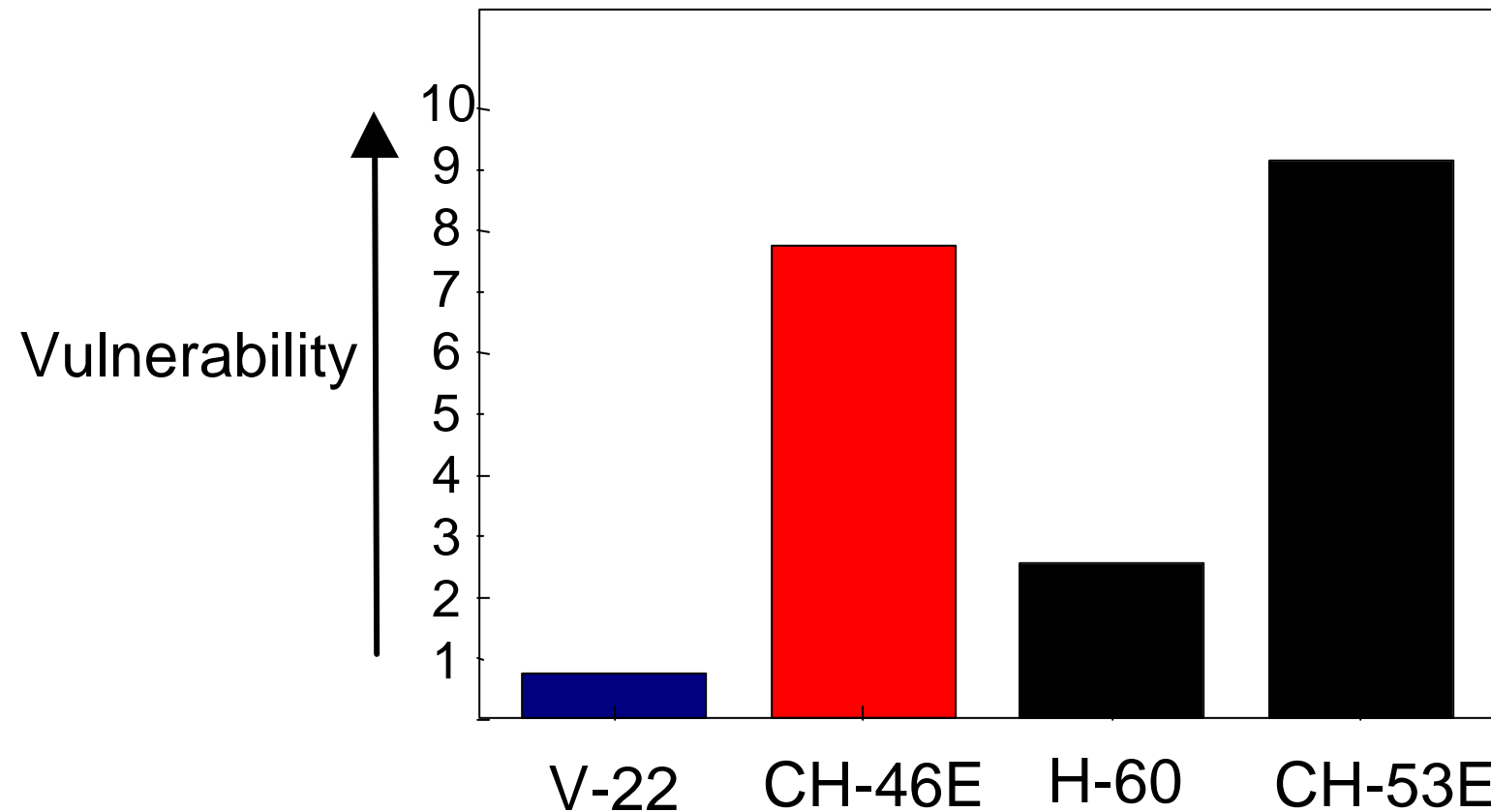
- **Energy Management**
 - Landing Gear
 - Mass Remote Design
 - Controlled Wing Failure
 - Anti-plow Nose Bulkhead
 - Energy Attenuating Seats
 - Shoulder Harness
- **Ditching Buoyancy Stability**
- **Emergency Egress**
- **Crashworthy Fuel System**
- **Broom Straw Proprotor Failure Mode**





Reduced Vulnerability to Fire

12.7 mm
Armor Piercing Incendiary





Low IR Signature

- Engine suppressors
- Aircraft design blocks direct line of sight to exhaust
- Engines mounted away from fuselage
- Use of coanda technology to redirect exhaust
- Program office continuing signature reduction effort to an UNPRECEDENTED level of IR detection



Very Survivable Combat Aircraft

EW WARNING AND COUNTERMEASURES

- RWR
- MWS
- LWS
- SIRFC
- CMD5
- DIRCM

ENERGY MANAGEMENT:

- “Broomstraw” Blade Failure
- Mass Remote Design
- Controlled Wing Failure
- Anti-plow Bulkhead
- Attenuating Cargo Restraints

SIGNATURE REDUCTION

- Visual
- Infrared
- Acoustic
- EMCON

SYSTEMS PROTECTION

- Armor
- Isolation
- Redundancy
- Separation

DITCHING BOUYANCY, STABILITY AND EMERGENCY EGRESS

DEFENSIVE WEAPON SYSTEM

DRY BAY AND ENGINE FIRE SUPPRESSION

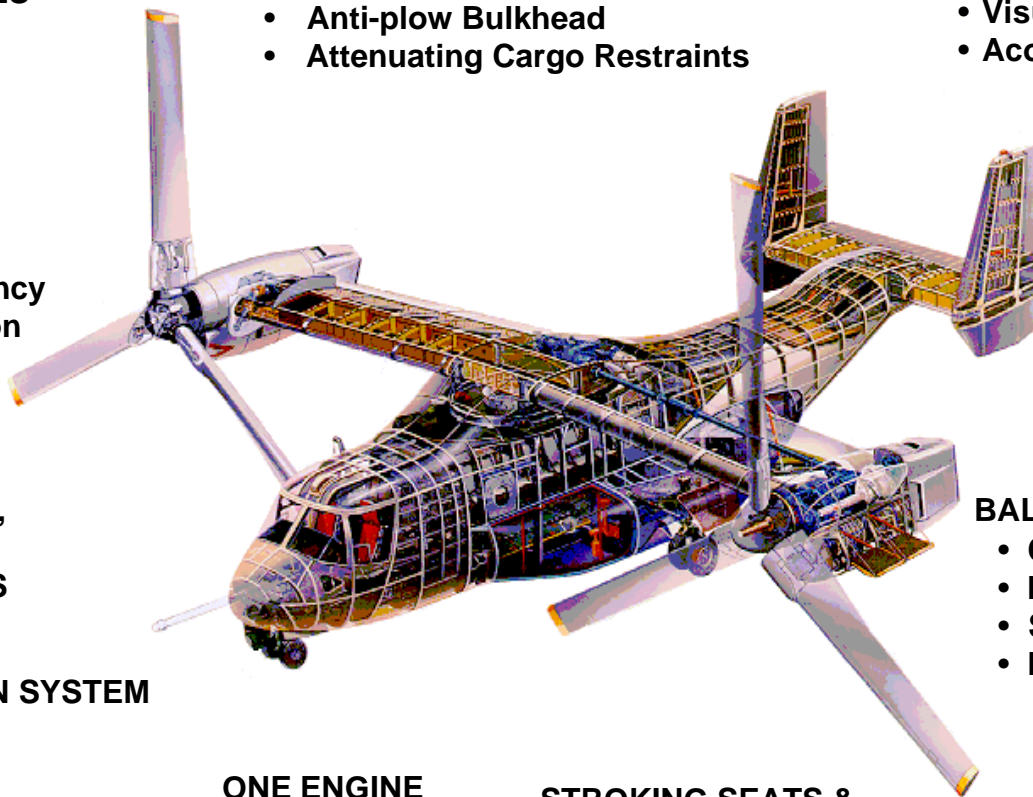
CRASHWORTHY FUEL SYSTEM

BALLISTIC TOLERANCE:

- Composite Structure
- Hydraulic Ram Protection
- Self-sealing Fuel Bladders
- Nitrogen Inerted Fuel System

ONE ENGINE INOPERATIVE CAPABILITY

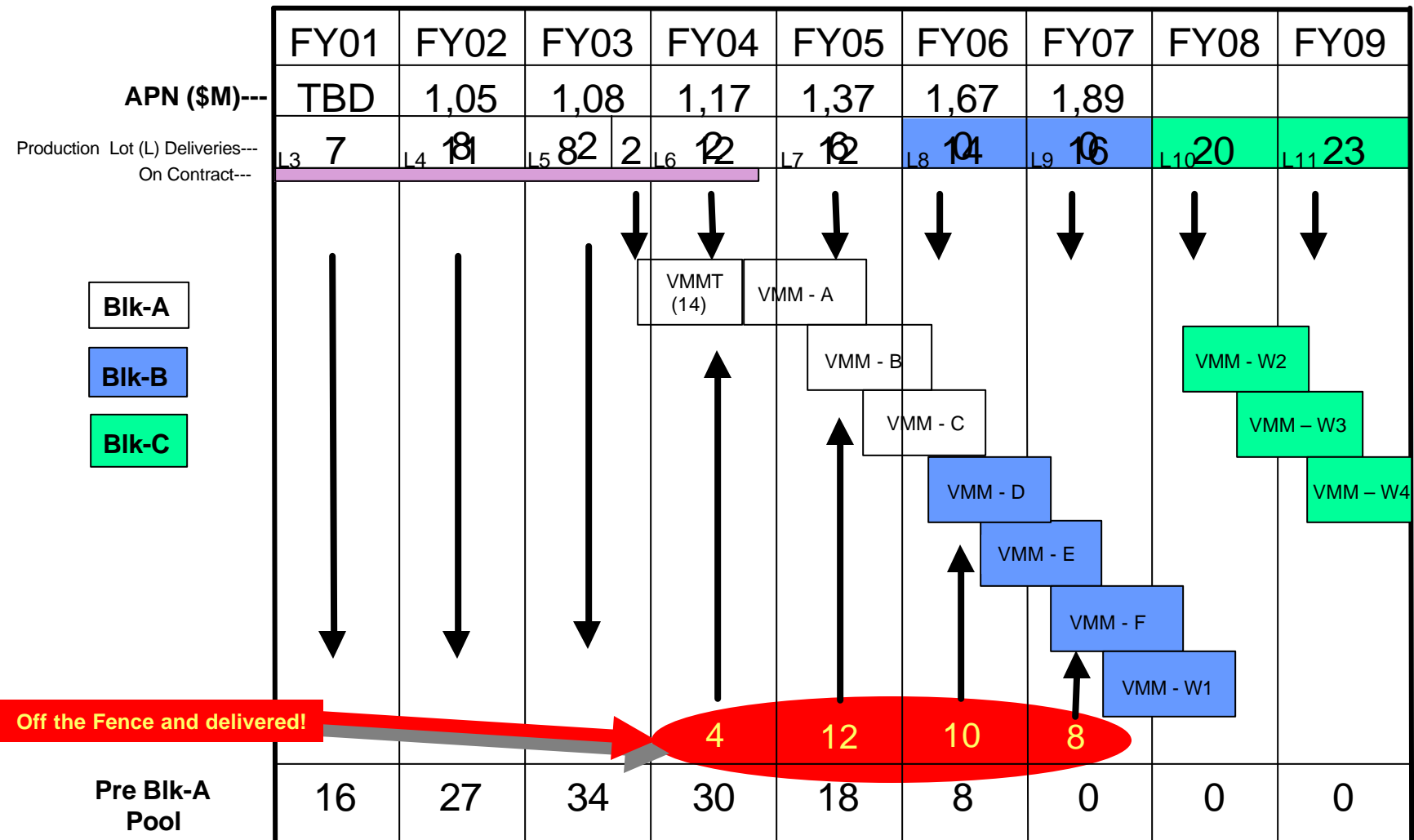
STROKING SEATS & SHOULDER HARNESSSES FOR TROOPS & CREW





MV-22 Deliveries

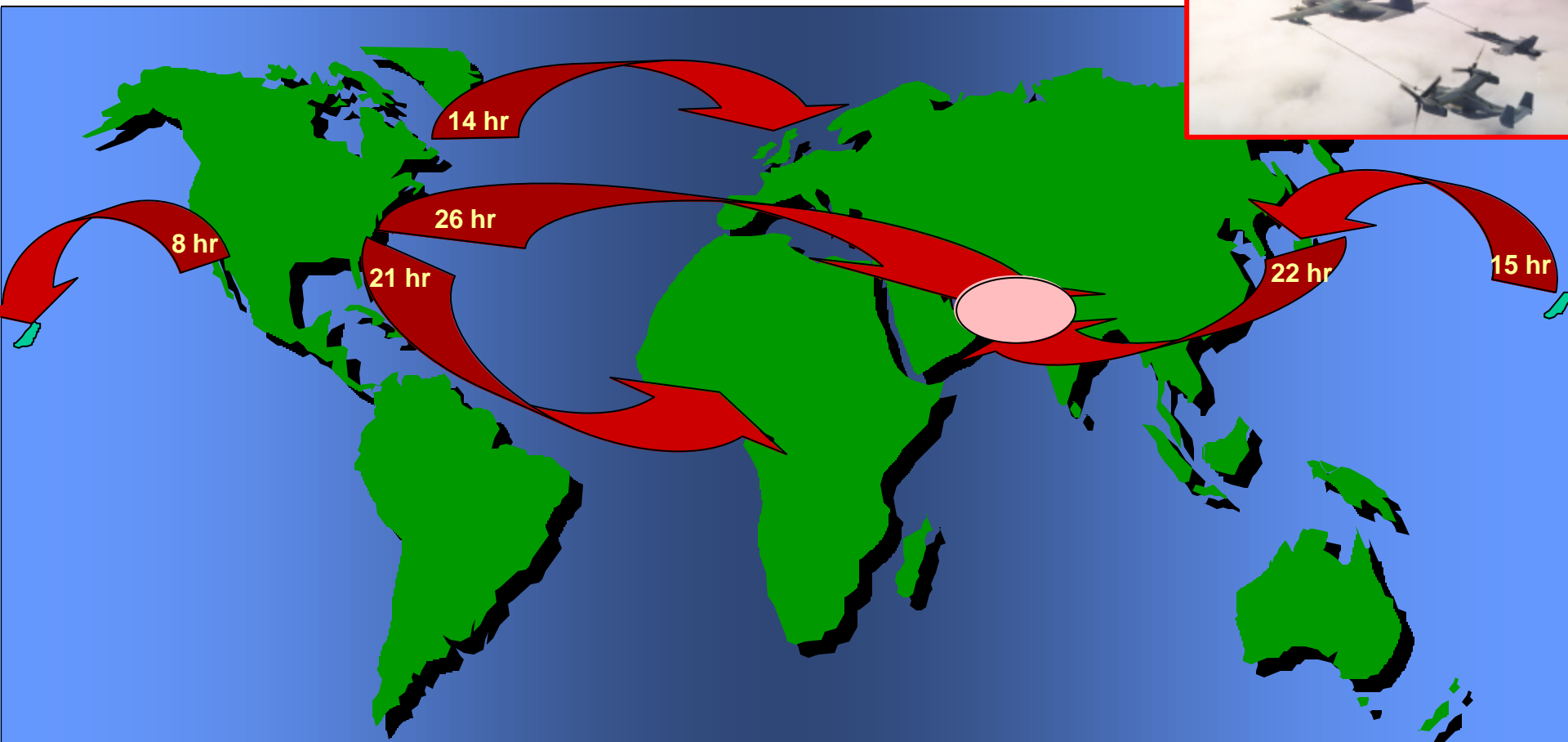
Conservative Standup Plan - Within Budget





V-22 Global Responsiveness

(Hours of Flight Time)



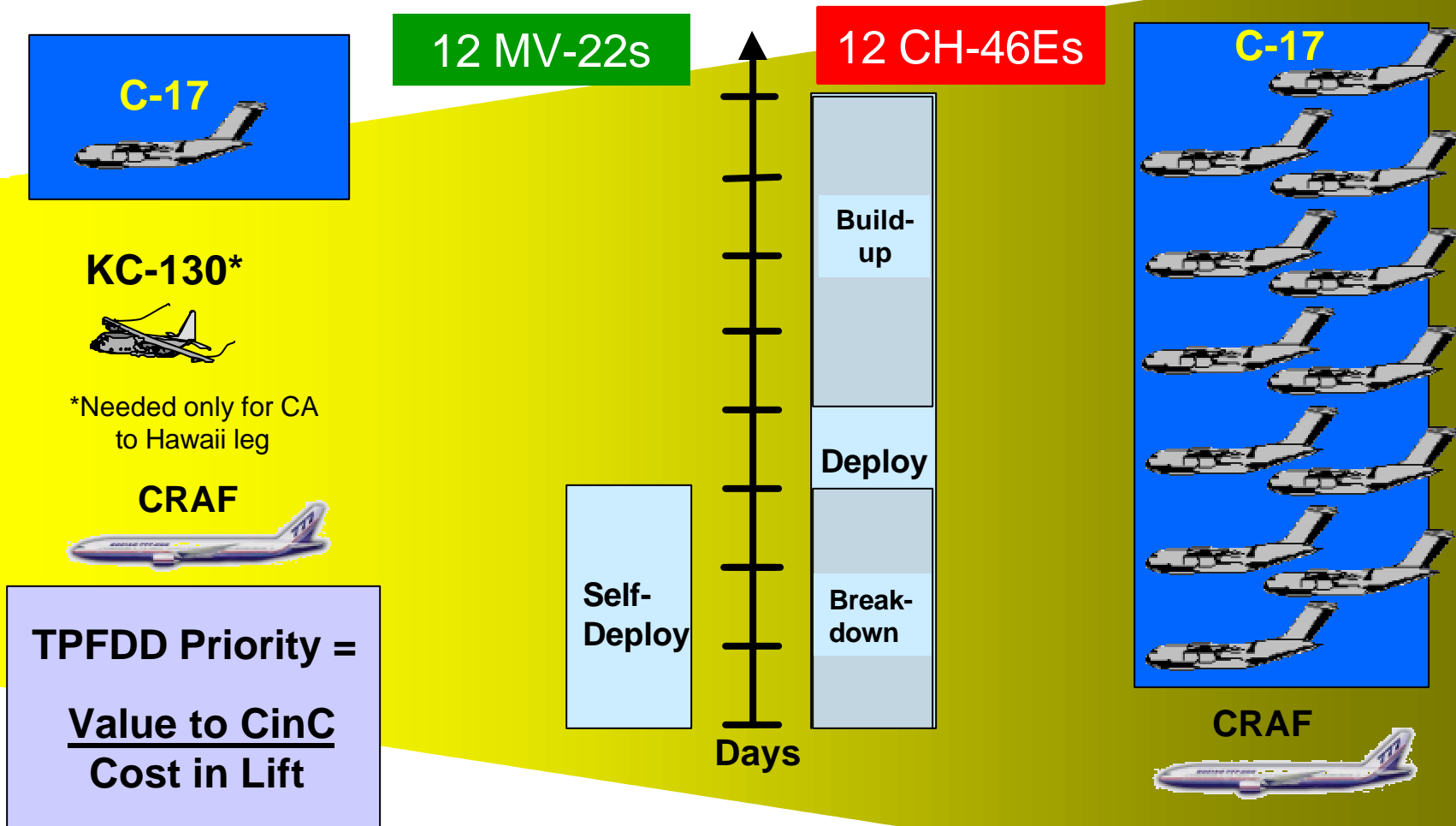
V-22's Self Deployment Capability

- Significantly Reduces the Need for Strategic Lift
- Reduces Time Lag in Critical Tactical Situations

Worldwide self-deployability



Squadron Self-Deployability

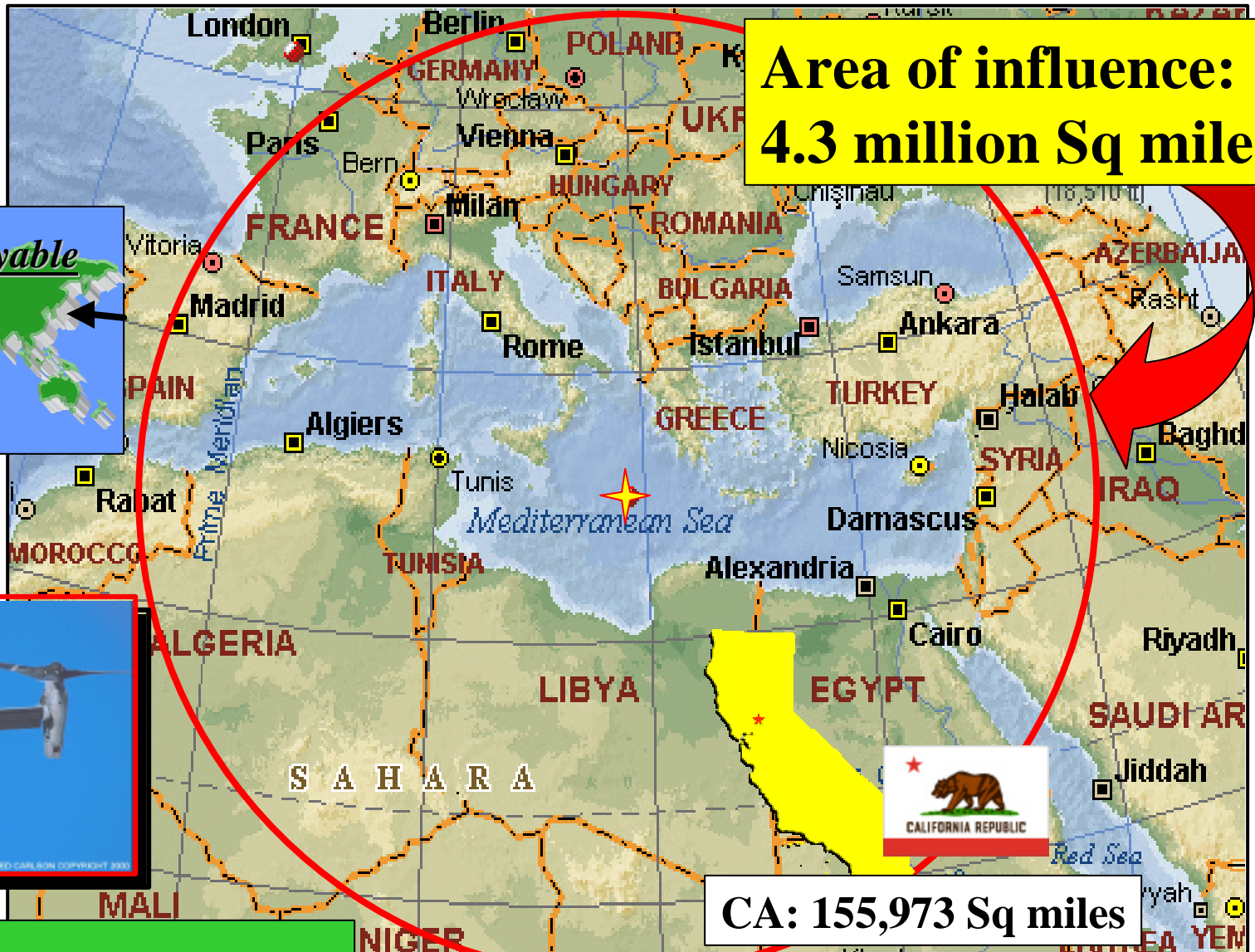


Self-deployment capability enables *strategic deployability*

Strategic Agility / Operational Flexibility



**Area of influence:
4.3 million Sq miles**



CA: 155,973 Sq miles

27 times the area of California

Ferry Profile

CONUS to Southwest Asia – 3 days

CONUS to North East Asia and Southwest Pacific – 2 days

CONUS to Andes – 1 to 2 days



Reduced Vulnerability

- **Low Signature**
 - Acoustic
 - IR
- **Countermeasures**
 - RWR
 - MWS
 - LWS
 - CMDS
 - DIRCM
 - SIRFC





Turreted Gun System

